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Emotional intelligence profile of High Academic Performance students in Computer Engineering

Several studies have documented the benefits of emotional intelligence particularly in the workplace. The main objective of universities is to educate in terms of acquiring capacities, abilities, competencies, and values, with the ultimate aim of promoting employment. In some Spanish universities, High Academic Performance Groups (HAPs) have been launched to strengthen the potential of the most outstanding students. This study is aimed to know the differences in the emotional intelligence profile of the HAP students. The study shows no significant differences, being recommendable to consider providing aid and support for HAP students in the development of this type of intelligence.

Keywords: emotional intelligence, higher education, computer engineer, high academic performance, workplace performance.

Introduction

Peter Salovey and John Mayer (1990) first introduced the concept of Emotional Intelligence (EI) as a set of skills that contribute to the expression of emotion in oneself and in others, the effective regulation of emotion in self and others, and the use of feelings to motivate, plan, and achieve in one's life.

To describe emotionally intelligent people, there are mainly two large EI models: the skills model, based on the formulation by Mayer and Salovey (Mayer, Caruso and Salovey 2000; Mayer and Salovey 1997; Mayer, Salovey and Caruso 2000), which envisions EI as a set of cognitive skills for handling emotions, and mixed models, which include some key personality traits within EI (Bar-On 2000; Cherniss 2000; Goleman 2001).

Within each of these EI models, different evaluation instruments have been developed, based on the dimensions that they consider. Based on the cognitive skills model, the Trait Meta-Mood Scale-48 (TMMS-48), which was developed by the

research group of Mayer and Salovey, the Spanish modified Trait Meta-Mood Scale-24 (TMMS-24), which is a reduced version of the TMMS-48 adapted into Spanish, and the Schutte Self-Report Inventory (SSRI) by Schutte, Malouff, Hall, Haggerty-Martin, Cooper, Golden, and Dornheim (1998), are all self-reported measures with acceptable internal consistency, reliability, and validity. On the other hand, based on this same model, skill measures have been based on a practical approach: the Multifactor Emotional Intelligence Scale (MEIS) by Mayer, Caruso, and Salovey (1999) and its reduced and improved version, the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT) by Mayer, Salovey, and Caruso (2002).

Regarding Mixed Emotional Intelligence Models, one may also use various instruments based on self-reported measures; the Bar-On Emotional Quotient Inventory -EQ-i- (Bar-On, 1997), the Trait Emotional Intelligence Questionnaire (TEIQue), which is similar to the EQ-i (Petrides and Furnham 2003), and the Emotional Competence Inventory –ECI- (Boyatzis, Goleman and Rhee 2000), stand out.

Benefits of EI

In the scientific literature, a great number of studies on the subject have followed. The benefit of EI has been documented in many areas of life (Stys and Brown 2004).

Some authors argue that an individual's adaptation to his or her environment can be determined by EI (Boyatzis, Goleman and Rhee 2000). This is shown by studies in the workplace (Møller and Powell 2001; Rozeil, Pettijohn and Parker 2001), in the field of education (Culver and Yokomoto 1999; Parker 2002; Sánchez et al. 2009), and in the area of mental health (Ciarrochi, Deane and Anderson 2002; Parker, Taylor and Bagby 2001; Salovey 2001).

The relationship between EI and performance has also been studied in numerous investigations. Parker, Summerfeldt, Hogan, and Majeski (2004) relate the emotional

profile of university students with academic performance. Boyatzis (2008), Brotheridge and Lee (2008), Cooper (1997), Dreyfus (2008), Koman and Wolff (2008) have found a relationship between EI and performance in companies. EI contributes to the performance of workers in a company and to the performance among workers, promoting positive relations among them, encouraging effective teamwork, building social capital (Caruso and Salovey 2004, and Goleman 1998), and allowing people to regulate their emotions to cope with stress, perform well under pressure and handle changes in the organization (Lopes, Grewal, Kadis, Gall, and Salovey 2006).

Through their research, other authors have contributed, showing the emotional skills of workers that are most valued by businesses and suggesting how an intervention in the university setting can improve workers' professional prospects (Authors, 2014).

The EI profile in the field of engineering

The emotional profiles of engineers have been evaluated in different studies. Authors (2010a) compare the emotional profiles of students from different scientific fields and have found differences in the emotional profiles of students according to their area of study, with engineering students being those with the fewest skills.

In the workplace, engineers are required to have a higher level of emotional competency than they have at the end of their studies (Authors, 2010b). On the other hand, anecdotal evidence shows that global competition combined with technical education makes these professionals much more acceptable to the labour market, improving their employability (Allan and Chisholm 2008).

In the university world, although the recognition of these competencies in engineering is relatively new, educators have recognized the need to include them in plans of study. In the guidelines for the development of new Information and Communications Technology (ITC) curricula, the need arises to include along with the

discipline itself, i.e., engineering and informatics, a qualification in other disciplines; some of these, such as behavioural capacities, are related to EI (Career Space 2001).

Although studies show that a better emotional profile can have a positive impact on the professional world and the educational community has included this type of intelligence in the engineering curriculum, the truth is that there are not a great number of interventions performed within engineering studies to improve it. The reason can be that specific skills are considered to be of greater relevance, and challenges that arise at the time of the intervention, if it is in the form of a complementary course, would take time away from students learning other specific skills (Bond and Manser, 2009; Oberst, Gallifa, Farriols and Vilaregut 2009).

Another reason that can hinder the development of emotional intelligence in the university world is the difficulty of performing them within an entire degree programme. However, an application to small groups of students can have a greater guarantee of success.

Degree in Computer Engineering and High Academic Performance Groups (HAPs)

With the objective of strengthening the potential of the most outstanding students from the outset of their university studies, the educational authorities in collaboration with public universities in the Community of Valencia (Spain) have launched a pioneering initiative in the area of higher education: the so-called High Academic Performance Groups (HAPs, or *Grupos de Alto Rendimiento Académico – ARA* in Spanish). HAP groups have all manner of aid and support to lead their members to reach the highest level of academic performance possible for the most brilliant students with the greatest aptitudes. These groups are characterized by having highly qualified professors, admitting a very small number of students, having a preference for Erasmus exchanges,

obtaining travel aid to learn languages, and obtaining training from research staff in diverse fields, among other aspects. Membership in this group is recognized with a specific mention in the European Supplement to their degree.

This study has focused on the HAP group in the Computer Engineering degree programme. The overall objective is to train professionals who are prepared to lead and perform the tasks related to systems, applications, and products to solve problems in any ITC area, applying their scientific knowledge and engineering methods and techniques.

In this case, the group was formed based on the highest academic records of students applying for group membership. Because this selection is performed in the first class, the grade that is considered for the purpose of joining the group is that which is used for access to the university.

Objective

Due to its reduced size and the type of student who composes it, the HAP group presents a good opportunity to know whether this type of selection has also led to a distinction at the level of emotional intelligence. Thus, the objective of this study is to know whether there are differences between the general emotional intelligence profile of students in the HAP group for the Degree in Computer Engineering and that of students studying in the traditional modality.

Method

Participants

To conduct this study, 88 students from the degree in Computer Engineering at a Spanish University were chosen and divided into two groups: a group of 44 students enrolled in HAP, and another group of 44 students enrolled in the traditional modality.

In the case of the HAP group, the 44 students belonged to two different groups (22 each one). In the case of the traditional group, due to the fact that this kind of groups is bigger (usually near 100 students) a random sample of 44 students was selected.

A total of 90% of the sample were men and 10% women, aged between 19 and 33 years old; the average age of the participants was 22 years old.

Instruments

In order to obtain the emotional profile of both student groups, an emotional intelligence evaluation measure based on the formulation of the theoretical model by Mayer and Salovey was used, in addition to another measure from mixed models. In particular, the following were used:

- The *Trait Meta-Mood Scale-24* -TMMS-24. This is an adapted version of the TMMS-48 -developed by Salovey and Mayer- (Salovey, Mayer, Goldman, Turvey, Palfai, 1995) that has 24 items instead of the 48 in the original. This self-reported test evaluates three of the classic EI features: attention to feelings, emotional clarity, and emotional repair. All participants were asked to comment on each test item using a five-point Likert-type scale (1 = strongly disagree, 5 = strongly agree). Each subscale is scored in a range from 0 to 50 points. The reliability of the three factors was high: attention (.90), clarity (.90), and repair (.86) (Fernández-Berrocal, Extremera, and Ramos 2004).
- The *Emotional Quotient Inventory: Short* (EQ-i:S) by Reuven Bar-On (2002). This instrument is a reduced version of the *Emotional Quotient Inventory* that consists of 51 items that are answered using a five-point Likert-type scale. This test assesses five general EI factors from mixed models: interpersonal skills, interpersonal skills, stress management, adaptability, and general mood. Each

subscale is scored in a range from 0 to 50 points. The EQ-i:S shows adequate validity and internal consistency in its subscales, with intervals between .65 and .86.

A brief explanation of each subscale is shown in Table 1.

Procedure

First, the instructors of the Computer Engineering course were contacted, both those teaching in the standard modality and those in the HAP group. Consent was requested, and the appropriate dates were chosen to perform the tests during class.

The data collection was conducted during the first quarter of the morning course, in the respective classrooms and during school hours. To perform the test, the subjects were given a maximum time of two hours to complete all tasks, with the mean time being approximately one hour.

Design and data analysis

To compare whether there are significant differences between the emotional intelligence profiles of Computer Engineering students in the HAP and in the normal group, a multivariate and univariate analysis of variance was conducted using the GLM statistical procedure for repeated measures with the SPSS v. 23.0 statistical package. To that end, a design that considered the intrasubject emotional variable and the intersubject variable for HAP and normal computer engineering students was adopted.

Results

Table 2 shows the means and standard deviations obtained for each student group for the different variables. The values obtained were generally high for most of the

variables and very similar between the two groups of students.

To compare the profiles of students from each of the degree courses, multivariate (MANOVA) and univariate (ANOVA) analyses of variance for repeated measures were performed.

The Box's M test shows homogeneity in the variance covariance matrices ($F_{(36, 24886)}$ = 1.378 and p = .065). However, Mauchly's sphericity test did not confirm sphericity for the DV matrix (W = .181, χ^2 = 142.849, df = 27 and p = .000). Therefore, the degrees of freedom for the within-subjects test were corrected, using Epsilon correction values. Although the Epsilon values, calculated according to the Greenhouse-Geisser estimate ε = .655, the Huynh-Feldt estimate ε = .704, and the lower bound estimate ε = .143, were low; once these corrections had been made. Next, the intrasubject tests are shown (Table 3) with the values for the effects of flatness (emotional effect) and parallelism (effect of emotional interaction * group).

The flatness test is significant (F = 169.95, *p* = .000, η^2partial = .66), thus showing that the profiles of both groups of students are not flat. However, the parallelism test is not significant (F =.87, *p* = .490, η^2partial = .01), showing parallel profiles among students in the HAP group and the students in the traditional group. The results of the test can be observed graphically in Figure 1.

On the other hand, with the aim of checking whether there are differences between the means of the two groups of students in the emotional variables as a whole, the levels test is conducted (Table 4). The results of this test show that there are no significant differences with regard to the emotional intelligence profile of the students enrolled in the normal Computer Engineering group and those in the HAP group (F = 1.544, $p \leq$ .217, η^2 partial = .018).

Finally, with the aim of confirming whether there are differences in any of the variables evaluated between students who belong to the HAP group and students who are enrolled in the normal group, a univariate analysis of each emotional variable is conducted (Table 5). Of the eight emotional variables analysed, seven did not show significant differences and that the emotional variables of attention, clarity, repair, intrapersonal, interpersonal, adaptability, and stress management of both student groups could be considered equal. However, the results showed significant differences in general mood, although both values are close (2.45 points).

Discussion and conclusions

As shown by a large number of studies that analyse and support the importance of EI in employability, academic and professional performance, and all areas of life, it is necessary to develop emotional intelligence among students. However, in the engineering profession, it has only been in the twenty-first century that the development of global competencies has been taken into account for engineer training at the worldwide level (Herling, Herling, and Peterson 2001).

Due to their small nature and the students who compose them, HAP groups represent a good opportunity to learn whether this selection has also resulted in a distinction at the level of emotional intelligence. HAP students scored slightly above the normal group for all the analysed subscales. However, the results of this study show that these differences were not significant, except for the general mood variable. Therefore, the emotional profile of students who belong to the HAP group and those under the normal modality could be considered as equal. HAP students in the Computer Engineering degree programme have not developed the emotional intelligence throughout their studies that would be desired for having greater success when joining the job market (Allan and Chisholm 2008).

If educational authorities continue to fund small HAP groups with the goal of empowering the most brilliant and the most skilled students and if emotional intelligence is required to successfully perform their professional work, then it would be desirable to consider providing aid and support for HAP students and investing in the development of this type of intelligence.

Experiences in the development of emotional intelligence outside the training provided by companies are rare; however, the results are very encouraging. At the university level, there have been a range of programmes that include the development of the EI skills, which are so necessary for the working world, in their curricula (Boyatzis, Cowen, and Kolb 1995; Boyatzis, Wheeler, and Wright 2001; Fallows and Steven 2000; Witt, Alabart, Giralt. Herrero, Vernis and Medir 2006).

A limitation to take into account in the present study is the number of participants, with the small sample due to the nature of the HAP group, implying two groups of students and the restricted number of individuals that it contains.

Future studies can aim at increasing the sample size of participants in new HAP groups created in subsequent years and designing interventions for the development of the emotional intelligence within the degree programme curricula at universities that specifically target these groups.

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Table 1. Emotional variables.

Variables	*Explanation*
Attention	How much attention one pays to his/her mood, personal problems, worries, etc.
Clarity	To what extent how can people perceive and consider their emotions have an influence on their work.
Repair	What belief or opinion one should have on their ability to interrupt and control negative thoughts and increase positive ones.
Intrapersonal Skills	To what degree one should be in touch with their emotions, be able to express how one feel and communicate his/her needs to others.
Interpersonal Skills	What ability one should have to establish co-operative, constructive and satisfactory relationships with other people (be good listener; able to understand and appreciate other people's feelings).
Adaptability	To what level one needs to successfully handle change and have the skills to solve daily problems by facing them in a positive way.
Stress Management	To what extent one needs to control their impulse and work well under pressure by controlling his/her stress.
General Mood	To what degree one needs to have a happy and optimistic outlook, be energetic and have the ability to self-motivate.

Table 2. Descriptive statistics, means and standard deviations for students of each group.

Variable		Mean	Std. Deviation	N
TMMS Attention	HAP	24.05	6.675	44
	Normal	23.95	5.835	44
	Total	24.00	6.233	88
TMMS Clarity	HAP	29.39	5.063	44
	Normal	27.30	6.515	44
	Total	28.34	5.895	88
TMMS Repair	HAP	29.86	5.416	44
	Normal	29.00	6.306	44
	Total	29.43	5.860	88
EQi Intrapersonal	HAP	38.11	5.784	44
	Normal	37.57	5.592	44
	Total	37.84	5.663	88
EQi Interpersonal	HAP	41.41	5.073	44
	Normal	40.86	3.915	44
	Total	41.14	4.514	88
EQi Stress Management	HAP	29.82	5.444	44
	Normal	29.70	5.373	44
	Total	29.76	5.378	88
EQi Adaptability	HAP	27.89	3.853	44
	Normal	27.86	4.486	44
	Total	27.88	4.157	88
EQi General Mood	HAP	41.82	4.479	44
	Normal	39.36	5.735	44
	Total	40.59	5.262	88

Table 3. Tests of Within-Subjects Effects.

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	η^2 partial	Noncent. Par.	Observ. Power[a]
Emotional	Sphericity Assumed	26074.11	7	3724.87	169.96	.000	.664	1189.71	1.000
	Greenhouse-Geisser	26074.11	4.58	5689.67	169.96	.000	.664	778.87	1.000
	Huynh-Feldt	26074.11	4.93	5290.30	169.96	.000	.664	837.67	1.000
	Lower-bound	26074.11	1.00	26074.11	169.96	.000	.664	169.96	1.000
Emotional * GROUP	Sphericity Assumed	134.25	7	19.18	.88	.526	.010	6.13	.381
	Greenhouse-Geisser	134.25	4.58	29.29	.88	.490	.010	4.01	.300
	Huynh-Feldt	134.25	4.93	27.24	.88	.496	.010	4.31	.312
	Lower-bound	134.25	1.00	134.25	.88	.352	.010	.88	.152
Error (Emotional)	Sphericity Assumed	13193.64	602	21.92					
	Greenhouse-Geisser	13193.64	394.11	33.48					
	Huynh-Feldt	13193.64	423.86	31.13					
	Lower-bound	13193.64	86.00	153.41					

a. Computed using alpha = ,05

Table 4. Tests of Between-Subjects Effects.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	η^2 partial	Noncent. Parameter	Observed Power[a]
Intercept	737761.506	1	737761.506	9155.429	.000	.991	9155.429	1.000
GROUP	124.455	1	124.455	1.544	.217	.018	1.544	.233
Error	6930.040	86	80.582					

a. Computed using alpha = ,05

Table 5. Independent Samples Test.

	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
TMMS Attention[1]	1.645	.203	.068	86	.946	.09	1.337	-2.566	2.748
TMMS Clarity[1]	2.347	.129	1.681	86	.096	2.09	1.244	-.382	4.564
TMMS Repair[1]	1.263	.264	.689	86	.493	.86	1.253	-1.628	3.355
EQi Intrapersonal[1]	.060	.807	.450	86	.654	.54	1.213	-1.866	2.957
EQi Interpersonal[1]	.115	.735	.565	86	.574	.54	.966	-1.375	2.466
EQi Stress Management[1]	.002	.965	.099	86	.922	.11	1.153	-2.179	2.406
EQi Adaptability[1]	1.455	.231	.025	86	.980	.023	.891	-1.749	1.795
EQi General Mood[1]	1.287	.260	2.238	86	.028	2.45	1.097	.274	4.635

[1] Equal variances assumed

Figure 1. Emotional intelligence profiles for the HAP and normal groups.